What is claimed is:

1. A carbon nanotube structure comprising:

plural carbon nanotubes; and

cross-linked sites formed from plural chemical bonds between functional groups, each of the functional groups bonded to different carbon nanotubes of the plural carbon nanotubes at least on one end,

wherein the plural carbon nanotubes constitute a mesh structure.

2. A carbon nanotube structure according to claim 1, wherein each of the chemical bonds between the plural functional groups is at least one chemical bond selected from the group consisting of -COOCO-, -O-, -NHCO-, -COO-, and -NCH-.

3. A carbon nanotube structure according to claim 1, wherein each of the chemical bonds between the plural functional groups is at least one chemical bond selected from the group consisting of -NH-, -S-, and -O-.

4. A carbon nanotube structure according to claim 1, wherein each of the chemical bonds between the plural functional groups is -NHCOO-.

5. A carbon nanotube structure according to claim 1, wherein each of the chemical bonds between the plural functional groups is -S-S-.

6. A carbon nanotube structure according to claim 1, wherein the cross-linked sites of the carbon nanotube structure are formed from chemical bonds that are obtained by causing a reaction between the functional groups of the plural carbon nanotubes having the same or different functional groups.

7. A carbon nanotube structure according to claim 6, wherein the reaction is a dehydration condensation reaction.

8. A carbon nanotube structure according to claim 7, wherein each of the functional groups is at least one functional group selected from the group consisting of -COOR (R is a substituted or unsubstituted hydrocarbon group), -COOH, -COX (X is a halogen atom), -OH, -CHO, and $-NH_2$.

9. A carbon nanotube structure according to claim 6, wherein the reaction is a substitution reaction.

10. A carbon nanotube structure according to claim 9, wherein each of the functional groups is at least one functional group selected

from the group consisting of $-NH_2$, -X (X is a halogen atom), -SH, -OH, $-OSO_2CH_3$, and - $OSO_2(C_6H_4)CH_3$.

11. A carbon nanotube structure according to claim 2, wherein the reaction is an addition reaction.

12. A carbon nanotube structure according to claim 11, wherein each of the functional groups is at least one functional group selected from the group consisting of -OH, and/or -NCO.

13. A carbon nanotube structure according to claim 6, wherein the reaction is an oxidative reaction.

14. A carbon nanotube structure according to claim 13, wherein each of the functional groups is -SH.

15. A carbon nanotube structure according to claim 1, wherein each of the plural carbon nanotubes is a multi-wall carbon nanotube.

16. A method of manufacturing a carbon nanotube structure, comprising the steps of:

supplying a base body with a liquid solution containing carbon nanotubes that have functional groups; and

cross-linking the plural carbon nanotubes to one another by

causing the functional groups to form chemical bonds among themselves to thereby form a mesh structure of the carbon nanotube structure.

17. A method of manufacturing a carbon nanotube structure according to claim 16, wherein the liquid solution contains an additive that causes the functional groups to form chemical bonds among themselves.

18. A method of manufacturing a carbon nanotube structure according to claim 16,

wherein the supplying step comprises an application step for applying the liquid solution to the base body, and

wherein the carbon nanotube structure is in a form of a layer.

19. A method of manufacturing a carbon nanotube structure according to claim 18, further comprising the step of patterning the carbon nanotube structure layer into a desired shape (a patterning step).

20. A method of manufacturing a carbon nanotube structure according to claim 19, wherein the patterning step is a step of performing dry etching on other regions of the carbon nanotube structure layer on the base body surface than a region to be patterned into the desired shape, thus removing the carbon nanotube structure

layer from those regions and patterning the carbon nanotube structure layer into the desired shape.

21. A method of manufacturing a carbon nanotube structure according to claim 19, wherein the patterning step comprises:

a resist layer forming step of forming a resist layer on the region of the carbon nanotube structure layer on the base body surface that is to be patterned into a desired shape; and

a removal step of removing the exposed portions of the carbon nanotube structure layer that are not covered with the resist layer by dry etching.

22. A method of manufacturing a carbon nanotube structure according to claim 21, wherein a side of the base body where the carbon nanotube structure layer and the resist layer are layered is irradiated with radicals of oxygen molecules in the removal step.

23. A method of manufacturing a carbon nanotube structure according to claim 21, wherein the side of the base body where the carbon nanotube structure layer and the resist layer are layered is irradiated with oxygen radicals that are generated by irradiating oxygen molecules with ultraviolet rays.

24. A method of manufacturing a carbon nanotube structure

according to claim 21, wherein the removal step in the patterning step is followed by a resist layer peeling step for peeling off the resist layer that is formed in the resist layer forming step.

25. A method of manufacturing a carbon nanotube structure according to claim 21, wherein the resist layer is a resin layer.

26. A method of manufacturing a carbon nanotube structure according to claim 20, wherein the patterning step is a step of performing selective irradiation with ion beams of gas molecule ions on regions of the carbon nanotube structure layer on the base body surface other than the region to be patterned into a desired shape thus removing the carbon nanotube structure layer from the irradiated regions and patterning the carbon nanotube structure layer into the desired shape.

27. A method of manufacturing a carbon nanotube structure according to claim 17, wherein the reaction is a dehydration condensation reaction and the additive is a condensing agent.

28. A method of manufacturing a carbon nanotube structure according to claim 27, wherein each of the functional groups is at least one functional group selected from the group consisting of -COOR (R is a substituted or unsubstituted hydrocarbon group),

-COOH, -COX (X is a halogen atom), -OH, -CHO, and $-NH_2$.

29. A method of manufacturing a carbon nanotube structure according to claim 28, wherein each of the functional groups is -COOH.

30. A method of manufacturing a carbon nanotube structure according to claim 27, wherein the condensing agent is at least one compound selected from the group consisting of sulfuric acid, N-ethyl-N'-(3-dimethylaminopropyl) carbodiimide, and dicyclohexyl carbodiimide.

31. A method of manufacturing a carbon nanotube structure according to claim 17, wherein the reaction is a substitution reaction and the additive is a base.

32. A carbon nanotube structure according to claim 9, wherein each of the functional groups is at least one functional group selected from the group consisting of $-NH_2$, -X (X is a halogen atom), -SH, -OH, $-OSO_2CH_3$, and $-OSO_2(C_6H_4)CH_3$.

33. A method of manufacturing a carbon nanotube structure according to claim 31, wherein the base is at least one base selected from the group consisting of sodium hydroxide, potassium hydroxide,

pyridine, and sodium ethoxide.

34. A method of manufacturing a carbon nanotube structure according to claim 16, wherein the reaction is an addition reaction.

35. A method of manufacturing a carbon nanotube structure according to claim 34, wherein each of the functional groups is at least one functional group selected from the group consisting of -OH, and/or -NCO.

36. A method of manufacturing a carbon nanotube structure according to claim 16, wherein the reaction is an oxidative reaction.

37. A method of manufacturing a carbon nanotube structure according to claim 36, wherein each of the functional groups is -SH.

38. A method of manufacturing a carbon nanotube structure according to claim 36, wherein the liquid solution contains an oxidative reaction accelerator.

39. A method of manufacturing a carbon nanotube structure according to claim 38, wherein the oxidative reaction accelerator is iodine.

40. A method of manufacturing a carbon nanotube structure according to claim 16, wherein each of the plural carbon nanotubes is a multi-wall carbon nanotube.

41. A method of manufacturing a carbon nanotube structure, comprising the steps of:

applying a liquid solution containing carbon nanotubes that have functional groups to a surface of a temporary substrate;

cross-linking the plural carbon nanotubes to one another by causing the functional groups to form chemical bonds among themselves to thereby form a mesh structure of a carbon nanotube structure layer;

patterning the carbon nanotube structure layer into a desired shape; and

transferring the patterned carbon nanotube structure layer to a base body.

42. A method of manufacturing a carbon nanotube structure according to claim 41, wherein a substrate having plasticity or flexibility is used as the base body.

43. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the transfer step is followed by

a pattern fixing step in which the patterned carbon nanotube structure layer that is transferred to the base body surface is fixed, along with the base body, to a second base body.

44. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the transfer step is a step of transferring the patterned carbon nanotube structure layer on the temporary substrate surface to a surface of an intermediate transfer body and transferring the carbon nanotube structure layer that is transferred to the intermediate transfer body surface to the base body.

45. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the cross-linking step includes a step of heating the carbon nanotube structure layer formed on the temporary substrate surface at a temperature lower than a melting point of the temporary substrate and equal to or higher than a melting point or glass transition temperature of the base body in order to cure the applied liquid solution.

46. A method of manufacturing a carbon nanotube structure according to claim 44, wherein the cross-linking step includes a step of heating the carbon nanotube structure layer formed on the temporary substrate surface at a temperature lower than a melting

point of the temporary substrate and equal to or higher than a melting point or glass transition temperature of the intermediate transfer body in order to cure the applied liquid solution.

47. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the patterning step is a step of performing dry etching on other regions of the carbon nanotube structure layer on the temporary substrate surface than a region to be patterned into a desired shape, thus removing the carbon nanotube structure layer from those regions and patterning the carbon nanotube structure into a pattern of the desired shape.

48. A method of manufacturing a carbon nanotube structure according to claim 47, wherein the base body has no resistance to the dry etching in the patterning step whereas the temporary substrate is resistant to the dry etching.

49. A method of manufacturing a carbon nanotube structure according to claim 44, wherein the patterning step is a step of performing dry etching on other regions of the carbon nanotube structure layer on the temporary substrate surface than a region to be patterned into a desired shape, thus removing the carbon nanotube structure layer from those regions and patterning the carbon nanotube structure layer into the desired shape, and

wherein the base body has no resistance to the dry etching in the patterning step whereas the temporary substrate is resistant to the dry etching.

50. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the patterning step comprises:

a resist layer forming step of forming a resist layer on a region of the carbon nanotube structure layer on the temporary substrate surface that is to be patterned into a desired shape; and

a removal step for bringing an etchant into contact with a side of the temporary substrate where the carbon nanotube structure layer and the resist layer are layered, thereby removing the carbon nanotube structure layer from the exposed regions that are not covered with the resist layer.

51. A method of manufacturing a carbon nanotube structure according to claim 50, wherein the base body has no resistance to the etchant used in the patterning step whereas the temporary substrate is resistant to the etchant.

52. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the patterning step comprises:

a resist layer forming step of forming a resist layer on a

region of the carbon nanotube structure layer on the temporary substrate surface that is to be patterned into a desired shape; and

a removal step for bringing an etchant into contact with a side of the temporary substrate where the carbon nanotube structure layer and the resist layer are layered, thereby removing the carbon nanotube structure layer from the exposed regions of that are not covered with the resist layer,

wherein the base body has no resistance to the etchant used in the patterning step whereas the temporary substrate is resistant to the etchant.

53. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the liquid solution contains an additive that causes the functional groups to form chemical bonds among themselves.

54. A method of manufacturing a carbon nanotube structure according to claim 53, wherein the reaction is a dehydration condensation reaction and the additive is a condensing agent.

55. A method of manufacturing a carbon nanotube structure according to claim 54, wherein each of the functional groups is at least one functional group selected from the group consisting

of -COOR (R is a substituted or unsubstituted hydrocarbon group), -COOH, -COX (X is a halogen atom), -OH, -CHO, and $-NH_2$.

56. A method of manufacturing a carbon nanotube structure according to claim 55, wherein each of the functional groups is -COOH.

57. A method of manufacturing a carbon nanotube structure according to claim 54, wherein the condensing agent is selected from any one of sulfuric acid, N-ethyl-N'-(3-dimethylaminopropyl) carbodiimide, and dicyclohexyl carbodiimide.

58. A method of manufacturing a carbon nanotube structure according to claim 53, wherein the reaction is a substitution reaction and the additive is a base.

59. A method of manufacturing a carbon nanotube structure according to claim 58, wherein each of the functional groups is at least one functional group selected from the group consisting of $-NH_2$, -X (X is a halogen atom), -SH, -OH, $-OSO_2CH_3$, and $-OSO_2(C_6H_4)CH_3$.

60. A method of manufacturing a carbon nanotube structure according to claim 58, wherein the base is at least one type of base selected from the group consisting of sodium hydroxide,

potassium hydroxide, pyridine, and sodium ethoxide.

61. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the reaction is an addition reaction.

62. A method of manufacturing a carbon nanotube structure according to claim 61, wherein each of the functional groups is at least one functional group selected from the group consisting of -OH, and/or -NCO.

63. A method of manufacturing a carbon nanotube structure according to claim 41, wherein the reaction is an oxidative reaction.

64. A method of manufacturing a carbon nanotube structure according to claim 63, wherein each of the functional groups is -SH.

65. A method of manufacturing a carbon nanotube structure according to claim 63, wherein the liquid solution contains an oxidative reaction accelerator.

66. A method of manufacturing a carbon nanotube structure according to claim 65, wherein the oxidative reaction accelerator is iodine.

67. A carbon nanotube transfer body, comprising:

a temporary substrate; and

a carbon nanotube structure layer carried on a surface of the temporary substrate, the carbon nanotube structure layer constituting a mesh structure by cross-linking plural carbon nanotubes to one another through cross-linked sites formed from plural chemical bonds between functional groups, each of the functional groups to different carbon nanotubes of the plural carbon nanotubes at least on one end, the carbon nanotube structure layer having a desired shape to be transferred to a base body,

wherein the temporary substrate is removed from the base body as the carbon nanotube structure layer is transferred to the base body.

68. A carbon nanotube transfer body according to claim 67, wherein each of the chemical bonds between the plural functional groups is at least one chemical bond selected from the group consisting of -COOCO-, -O-, -NHCO-, -COO-, and -NCH-.

69. A carbon nanotube transfer body according to claim 67, wherein each of the functional groups is at least one functional group selected from the group consisting of -NH-, -S-, and -O-.

70. A carbon nanotube transfer body according to claim 67, wherein each of the chemical bonds between the plural functional groups is -NHCOO-.

71. A carbon nanotube transfer body according to claim 67, wherein each of the chemical bonds between the plural functional groups is -S-S-.

72. A carbon nanotube transfer body according to claim 67, wherein the cross-linked sites of the carbon nanotube structure layer are formed from chemical bonds that are obtained by causing a reaction between the functional groups in a liquid solution that contains the carbon nanotubes having the functional groups.

73. A carbon nanotube transfer body according to claim 72, wherein the chemical bonds are formed by any one of a condensation reaction, a substitution reaction, an addition reaction, and an oxidative reaction.

74. A carbon nanotube transfer body according to claim 67, wherein a substrate having plasticity or flexibility is used as the temporary substrate.

75. A liquid solution comprising:

plural carbon nanotubes each having a functional group; and

an additive for bonding the functional group of one of the carbon nanotubes to the functional group of another of the carbon nanotubes.

76. A liquid solution according to claim 75, wherein the additive is a condensing agent.

77. A liquid solution according to claim 76, wherein each of the functional groups is at least one functional group selected from the group consisting of -COOR (R is a substituted or unsubstituted hydrocarbon group), -COOH, -COX (X is a halogen atom), -OH, -CHO, and $-NH_2$.

78. A liquid solution according to claim 77, wherein each of the functional groups is -COOH.

79. A liquid solution according to claim 76, wherein the condensing agent is at least one compound selected from the group consisting of sulfuric acid, N-ethyl-N'-(3-dimethylaminopropyl) carbodiimide, and dicyclohexyl carbodiimide.

80. A liquid solution according to claim 75, wherein the additive is a base.

81. A liquid solution according to claim 80, wherein each of the functional groups is at least one functional group selected from the group consisting of $-NH_2$, -X (X is a halogen atom), -SH, -OH, $-OSO_2CH_3$, and $-OSO_2(C_6H_4)CH_3$.

82. A liquid solution according to claim 80, wherein the base is at least one type of base selected from the group consisting of sodium hydroxide, potassium hydroxide, pyridine, and sodium ethoxide.

83. A liquid solution according to claim 80, wherein each of the functional groups is -OH, and/or -NCO.

84. A liquid solution according to claim 75, wherein the additive is an oxidative reaction accelerator.

85. A liquid solution according to claim 84, wherein each of the functional groups is -SH.

86. A liquid solution according to claim 84, wherein the oxidative reaction accelerator is iodine.

87. A liquid solution according to claim 75, wherein each of

the plural carbon nanotubes is a multi-wall carbon nanotube.